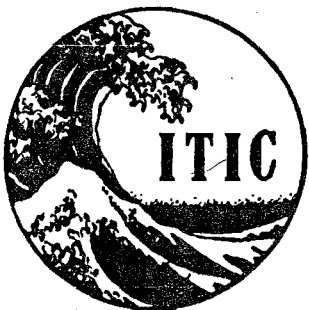


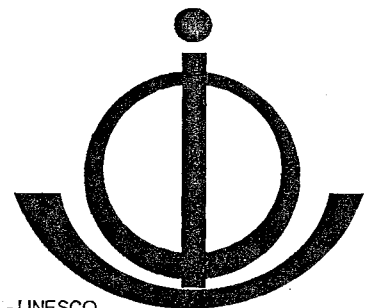


TSUNAMI NEWSLETTER

NOVEMBER 1988
VOLUME XXI, No. 1



INTERNATIONAL
TSUNAMI
INFORMATION
CENTER



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TELEX: 984624 (ITIC UD)

—UNESCO—
INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION
COMMISSION OCEANOGRAPHIQUE
INTERGOUVERNEMENTALE
COMISION OCEANOGRAFICA INTERGUBERNAMENTAL
МЕЖПРАВИТЕЛЬСТВЕННАЯ ОКЕАНОГРАФИЧЕСКАЯ КОМИССИЯ
اللجنة الحكومية لعلم المحيطات

INTERNATIONAL TSUNAMI INFORMATION CENTER

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Telephone: (808) 541-1658
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Director: Dr. George Pararas-Carayannis

TSUNAMI NEWSLETTER is published by the International Tsunami Information Center to bring news and information to scientists, engineers, educators, community protection agencies and governments throughout the world.

We welcome contributions from our readers.

The International Tsunami Information Center (ITIC) is maintained by the U.S. National Oceanic and Atmospheric Administration (NOAA) for the Intergovernmental Oceanographic Commission (IOC). The Center's mission is to mitigate the effects of tsunamis throughout the Pacific.

MEMBER STATES

Present membership of the IOC International Coordination Group for the Tsunami Warning System in the Pacific (ITSU) comprises of the following States:

AUSTRALIA	JAPAN
CANADA	MEXICO
CHILE	NEW ZEALAND
CHINA	PERU
COLOMBIA	PHILIPPINES
COOK ISLANDS	REPUBLIC OF KOREA
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA	SINGAPORE
ECUADOR	THAILAND
FIJI	UNITED KINGDOM (HONG KONG)
FRANCE	UNITED STATES OF AMERICA
GUATEMALA	UNION OF SOVIET SOCIALIST REPUBLICS
INDONESIA	WESTERN SAMOA

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NEWS EVENTS

THIRD INTERNATIONAL CONFERENCE ON NATURAL AND MAN-MADE HAZARDS IN COASTAL ZONES, SAN DIEGO, USA - ENSENADA, MEXICO, 14-21 AUGUST 1988

The International Conference for Natural and Man-Made Hazards in Coastal Zones was held at San Diego, California (Scripps Institution of Oceanography) and at CICESE (Centro de Investigacion Cientifica y de Educacion Superior de Ensenada, B.C.), Ensenada Mexico, on 14-21 August 1988. This was the third such conference to be held. The conference was very successful and attracted prominent people in disaster management and mitigation from all over the world. The conference included topics on all man-made and natural hazards affecting the worlds coastal zones, including earthquakes, tsunamis, surges, erosion and engineering problems, wind storms landslides, pollution, etc. A special session was held on risk management and insurance, the legal aspects of hazards, and on plans and proposals for the International Decade of Natural Hazard Reduction.

The Scientific Program included presentations which were grouped into the following themes:

- A. Near-Shore Earthquakes and Landslides
- B. Coastal Erosion and Engineering Aspects
- C. Wind Storm Motion and Coastal Effects
- D. Air and Water Pollution Risk and Management
- E. Tsunami Generation, Propagation and Coastal Impact
- F. Ecological Hazards to Coastal Marine Environment
- G. Legal Aspects of Coastal Hazards Prediction and Mitigation
- H. Plans and Programs in Support of the Inter-

national Decade of Natural Disaster Reduction (IDNDR)

- I. General Poster Session
- J. Final Plenary Session

HAZARDS 88 REPORT

The Third International Conference on Natural and Man-Made Hazards in Coastal Zones (Hazards 88) was attended by participants from 16 different countries, including representatives from USA, China, Japan, Korea, India, and New Zealand. A total of 80 papers were submitted for the 4-day long technical sessions.

Hazards 88 was opened by the Chairman of the International Organizing Committee, Dr. George Pararas-Carayannis who welcomed the participants and explained the importance of the conference. Mr. George Curtis, President of the Tsunami Society, followed with a message. Mr. Hans Einhaus, Under-Secretary-General of the United Nations, and Deputy Director of the United Nations Disaster Relief Organization (UNDRO), and Secretary of the United Nations Steering Committee for the IDNDR, presented a communique, focusing on the need to mitigate the effects of disasters. Keynote scientific overview presentations were given by Dr. Reinhard Flick, Dr. William Van Dorn, and Dr. Walter Munk of Scripps Institution of Oceanography. The Conference was opened at the Sumner Auditorium of the Scripps Institution of Oceanography following the inaugural plenary session. Participants were transported to Ensenada, Mexico where the technical sessions were held. Dr. Salvador Farreras, President of the local committee, opened the meeting on Tuesday, August 16, 1988. Brief welcoming remarks were made by the Governor of the State of Baja California, Licenciado Leyva Mortera; Almirante Gilberto Lopez Lira of the Mexican Navy; Dr. Alfredo Felix Buenrostro, Rector of the University of Baja California; Dr. Saul Alvarez, Director of CICESE; Dr. Mario Martinez, Vice-President of

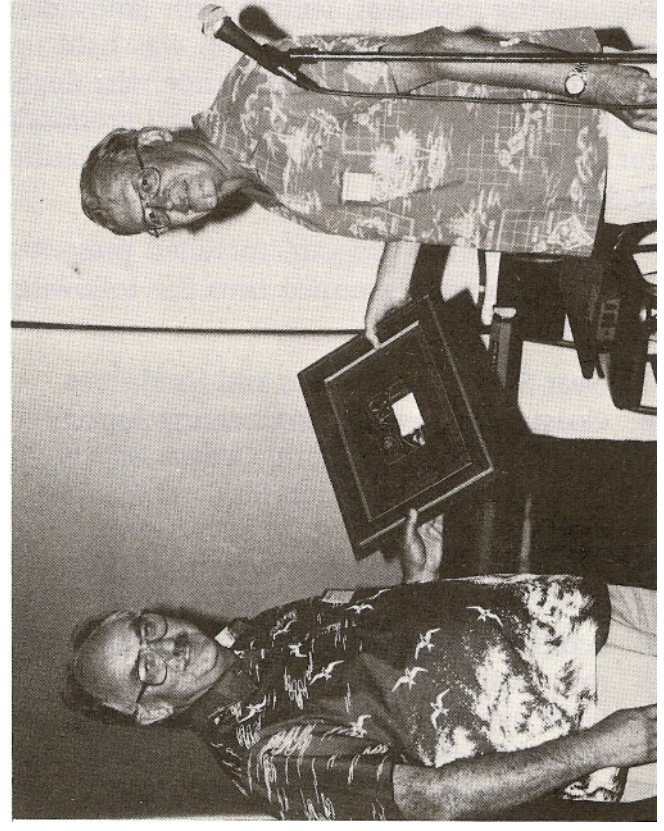


(left) The Governor of the State of Baja California, Lic. Leyva Mortera welcomes participants to the Hazards 88 Conference. Also shown are Dr. G. Pararas-Carayannis (l.), Chairman of the International Organizing Committee, and Dr. Alfredo Felix Buenrostro (r.), Rector of the University of Baja California.

(bottom left) Mr. James Lander receives the Tsunami Society award for best tsunami research paper presented at the Hazards 88 Conference, from Tsunami Society President, Mr. George Curtis.

(bottom right) Dr. Cinna Lomnitz receives the Tsunami Society award for best earthquake research paper presented at the Hazards 88 Conference, from Tsunami Society President, Mr. George Curtis.

A third award was presented by Mr. Curtis to Prof. S. Soloviev of the USSR for his long-term research contributions on tsunamis.



CONFERENCIA INTERNACIONAL ~ INTERNATIONAL CONFERENCE DESASTRES COSTEROS NATURELES O PROVOCADOS. NATURAL AND MAN-MADE HAZARDS IN COASTAL ZONES. Ensenada Baja California Mexico Agosto/august 14-21 1988

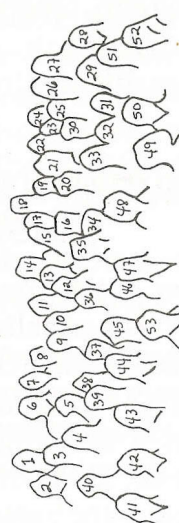


1. Richard L. Sillico
2. Gary Webb
3. Patricia Lockridge
4. Roderick Bryce
5. Julie Thomas
6. Vice Adm. Gilberto Lopez L.
7. Nicolas Grijalva
8. Luis Meneses V.
9. David Castel
10. Sergio Cruz L.
11. Srinivasan Venkatesh
12. Josue Cornejo
13. Gerhard Dohler
14. Larry Pearce
15. Willie Rapatz

18. George Curtis
19. Kurian Njialackil
20. Josue Alvarez
21. Barbara Siegel
22. Major Pedro L. Gay T.
23. Petar Jovanovic
24. Lte. Coronel Arturo Lopez S.
25. Carlos Angulo
26. Ricardo Troncoso
27. Antonio Sanchez D.
28. Fred Camfield
29. Isabel Secundino
34. Mohammed Khalequzzaman
35. Gustavo Orozco
36. Joseph Talbot

39. Oscar Delgado
40. Geoffrey Holland
41. Francisco Ocampo T.
42. Luis G. Alvarez
43. Jose Luis Aguilar
44. Efrain Gutierrez
45. George Pararas-Carayannis
46. Kathleen Shimmmin
47. Salvador Farreras
48. Mohammed El-Sabh
49. Luz M. Salas
50. Shourky Messieh
51. Wang Jingyong
52. Manuel Mancilla P.
53. S. K. Gosh

COASTAL HAZARDS CONFERENCE, ENSENADA 1988
 PHOTOGRAPH IDENTIFICATION



the Mexican Geophysical Union; and Dr. Pararas-Carayannis, Chairman of the International Organizing Committee.

NATURAL HAZARDS SOCIETY (NHS) IS BORN

A new professional society for natural hazards has been established. The objectives of the INTERNATIONAL SOCIETY FOR THE PREVENTION AND MITIGATION OF NATURAL HAZARDS, as it is being officially named, are to promote the study of all aspects of natural hazards, the distribution of preparedness and emergency-response plans for all countries, and the formulation and implementation of education programs on hazards prevention and mitigation.

The founding organizational meeting was held on August 19, 1988 in Ensenada, Mexico. At this meeting, attended by about 100 participants from sixteen countries, a constitution and Bylaws for the society was adopted and the following officers were elected:

President:

Dr. M.I. El-Sabh (Canada)

Vice-President:

Dr. G. Pararas-Carayannis (USA)

Secretary:

Dr. T.S. Murty (Canada)

Treasurer:

Dr. S. Venkatesh (Canada)

Representatives-at-Large:

Dr. S.F. Farreras (Mexico)

Dr. S.K. Ghosh (India)

Dr. F.S. Liu (China)

The Society shall hold at least one international scientific meeting every two years at different parts of the world, with special symposia on topical natural disaster events or natural hazard studies. In addition, the NHS

cosponsors appropriate scientific meetings, summer schools, or workshops organized by other bodies. NATURAL HAZARDS: An International Journal of Hazards Research and Prevention is now the official scientific publication of the new society. The journal is published at regular intervals by Kluwer Academic Publishers in the Netherlands.

Membership of the NHS is open to all international scientists and policy makers actively engaged in natural hazard studies or the prevention and mitigation of natural disasters. It may be secured by individuals or through societies, institutes, laboratories, groups or organizations. Dues for 1988 are US \$20 per year for all individual members, US \$5 for students. Individuals affiliated to the Society are entitled to subscribe to Natural Hazards Journal at a special reduced rate, and to attend the bi-annual meetings at a reduced registration fee.

Sections of the NHS, consisting of members of the Society and other persons engaged in natural hazards research or the prevention and mitigation of natural disasters, residing within an appropriate distance of a central point or sharing a common interest or problem, may be organized as provided in the Bylaws. For general information about the Society or membership inquiries and applications, write to one of the following address:

Professor M.I. El-Sabh
President
Natural Hazards Society
310 Allee des Ursulines
Rimouski (Quebec)
Canada G5L 3A1

Dr. T.S. Murty
Secretary
Natural Hazards Society
P.O. Box 6000
Sidney, B.C.
Canada V8L 4B2

INTERNATIONAL ASSOCIATION FOR THE PHYSICAL SCIENCES OF THE OCEANS (IAPSO)

IAPSO Commission on Natural Marine Hazards

Natural and man-made hazards such as tropical cyclones, floods, storm surges, tsunamis, severe waves, red tides, earthquakes, environmental pollution, volcanic eruptions, chemical pollutions, etc., present worldwide and global challenges knowing no national or international boundaries and therefore present challenge and life-threatening problems to all the people of the world. In fact, unless conscious and dedicated efforts by all nations are developed and implemented, the lives and the quality of lives of all people on earth are seriously and irreparably threatened.

In December 1987, the United Nations General Assembly adopted resolution 42/169 to designate the 1990's as a Decade in which the International community, under the auspices of the United Nations, will pay special attention to fostering international cooperation in the field of natural disaster reduction. The objective of this Decade is to reduce, through concerted international actions, especially in developing countries, loss of life, property damage and social and economic disruption caused by natural disasters.

While geological and geophysical natural hazards, such as earthquakes and volcanoes, are well organized by IASPEI, IAVCEI and those of meteorological origin are taken care by IAMAP, natural marine hazards did not receive too much attention in the past. To overcome this problem and in order to allow IAPSO to play its major role in the next decade, an IAPSO Commission on Natural Marine Hazards was established recently.

The terms of references are:

1) To support and interact with other bodies interested in natural marine hazards,

2) To encourage scientific research in all types of natural and man-made marine hazards in order to provide basic knowledge and understanding on the causations and ramifications of such hazards on the quality of human lives,

3) To convene working groups, periodic and regular international conferences,

4) To encourage exchanging the results of scientific research and provide a forum for the open discussion of pertinent and relevant subject matters of international interest, concern and significance,

5) To formulate scientific consensus regarding mitigation of such hazards.

- The resolution was adopted on 23 August 1988 during the IAPSO Executive Committee meeting held in Acapulco, Mexico. Professor Mohammed I. El-Sabh (Canada) was nominated as the President of the Commission.

SOLOMON ISLANDS EARTHQUAKE 10 AUGUST 1988

A major earthquake occurred in the vicinity of the Solomon Islands on 10 August 1988. There were no immediate reports of damage or injury.

The quake registered 7.3 on the Richter scale and had its epicenter 60 miles east of Guadalcanal. The Pacific Tsunami Warning Center (PTWC) in Honolulu issued an informational bulletin that no threat of a destructive Pacific-wide tsunami existed, but some areas in the vicinity of the quake could experience small sea level changes.

STRONG NEPAL EARTHQUAKE OF AUGUST 20, 1988

A strong earthquake measuring 6.5 on the Richter scale with epicenter about 100 miles southeast of Katmandu, hit the Himalayan

kingdom of Nepal and eastern India on August 21. The quake triggered landslides and collapsed buildings. More than 210 people may have died, but there were few details.

According to Radio Nepal at least 60 people were killed in Dharan by collapsing houses. In one area of Dharan 90 percent of the houses collapsed. According to the India News Agency in addition to 100 who were feared dead in India and Nepal, 1,000 people were injured in the Indian States of Bihar, Sikkim and West Bengal.

STRONG EARTHQUAKE HITS INDONESIA, AUGUST 18, 1988

According to Indonesian sources a strong earthquake jolted the Indonesian island of Celebes, at 6:09 am on August 18. The earthquake's magnitude was reported initially at 4.8 but later as 5.6 Its epicenter was 15 miles northwest of Manado. The quake damaged buildings on Celebes island and injured nine people. No deaths were reported.

UNDRO HOLDS REGIONAL TSUNAMI MEETING INOCAR, GUAYAQUIL, ECUADOR, 6-9 JUNE 1988

The United Nations Disaster Relief Organization (UNDRO) held a special meeting under its General Disaster Preparedness Program in Ecuador. The Regional Tsunami Meeting was held at the Oceanographic Institute of the Ecuadorian Navy (INOCAR) in Guayaquil, Ecuador, on 6-9 June 1988. The meeting was well organized and dealt with all aspects of the tsunami problem for the region, with plans of warning and evacuation, with the micronization of the tsunami hazard, as well as with plans for the mitigation of the effects of tsunami and other natural disasters. Dr. Julio Kuroiwa of the National University of Engineering

in Peru, acted as Chairman and Coordinator. The meeting was attended by representatives from Chile, Colombia, Ecuador, Guatemala, Honduras, and Peru. Dr. George Pararas-Carayannis, Director of ITIC, was also invited by UNDRO, and attended the meeting representing IOC, ITSU, and the United States.

SMALL TSUNAMI RECORDED AT RAPA, NEW CALEDONIA, 20 OCTOBER 1986

Copies of the sea level records at Rapa, New Caledonia sent recently to Professor Klaus Wyrtki, University of Hawaii, show that a small tsunami registered last year on the island of Rapa (Archipel des Australes), in the Bay of Haurei at approximately 2 o'clock in the morning of 20 October 1986. Maximum oscillation was in the order of 10 to 12 centimeters.

XIII GENERAL ASSEMBLY OF THE EUROPEAN GEOPHYSICAL SOCIETY, UNIVERSITY OF BOLOGNA, ITALY, 21-25 MARCH 1988

European Tsunami Working Group Established

One very important result of the Tsunami Meeting held in conjunction with the XIII Annual General Assembly of the European Geophysical Society (EGS) was the formation of a Working Group entitled "Tsunamis in the European Seas and in the Atlantic Ocean." The Group was formed within the framework of EGS with the aim of promoting the research and the international cooperation on a number of very interesting items, such as: the collection of high quality historical tsunami catalogs, tsunami zoning, the calculation of tsunami travel time charts, numerical simulation of major tsunamis, as well as future predicted tsunami events, the theoretical aspects of tsunami generation, propagation, coastal

hazards, assessment and mitigation, tsunami data acquisition and processing, and the Tsunami Warning System.

Prof. Stefano Tinti of the University of Bologna assumed the role of coordinator for the initial stage and the Working Group is open to all researchers willing to be active in this field, regardless of EGS membership.

The XIII General Assembly of the European Geophysical Society was held at the Palazzo Re Enzo, the Palazzo dei Notai and the Palazzo dell' Archigimnasio located in the historic city of Bologna, Italy, from 21-25 March 1988.

The scientific program included sections on Solid Earth and Planets, Hydrospheres and Atmospheres, a number of symposia and workshops in Meteorology, Oceanography, and Solid Earth Geophysics. One of the symposia was on Tsunamis Generated by Earthquakes and Volcanic Eruptions: Theory and Observations. Conveners of this symposium were W.M. Adams (Hawaii), S.L. Soloviev (Moscow), and S. Tinti (Bologna). A total of 17 papers were presented at this symposium as shown below.

Mediterranean Tsunamis and Their Comparison with Pacific Tsunamis – S.L. Soloviev

Historical and Recent Tsunamis in the European Area – V.S. Moreira

A Review of the Historical 1627 Tsunami in the Southern Adriatic –
E. Guidoboni and S. Tinti

Integration of the Catalog of the Tsunamis of the Italian Coasts –
M. Caputo

The Tsunami Generated from the Eruption of the Volcano of Santorin in the Bronze Age –
G. Pararas-Carayannis

Mathematical Simulation of Tsunami Excitation by Dislocations of Ocean Bottom

– S.F. Dotsenko and S.L. Soloviev

Numerical Experiments for the Largest 1783 Tsunami in Southern Calabria, Italy – S. Tinti and E. Guidoboni

On Cauchy-Poisson Waves with Finite Energy – F. Mainardi

Basing Improvement of Tsunami Warning Systems on Previous Experience - W.M. Adams

On Audible Tsunami Precursor on the Coast - S. Nakamura

Numerical Simulation of Tsunami Generation by Earthquakes - T.S. Murty and Z. Kowalik

Tsunami Modelling – I.R. Warren, H.I. Bundgard and R. Gaulon

Tsunami Induced Oscillations in Corinth Bay Measurements and 1-D vs 2-D Numerical Models –
C. Koutitas and A. Laskaratos

Numerical Modeling of Tsunami Induced Oscillation of Rabaul Harbor – C.L. Mader

Tsunamis Generated in Cook Inlet, Alaska, by Debris Avalanche Activity on Augustine Island: Historic Eruption and Predicted Future Scenario – J. Kienle, Z. Kowalik and T.S. Murty

Survey of Research on Tsunami Run-Up in USSR – E.N. Pelinovski

The Ancient Greeks on the Phenomenon of Seismic Sea Waves –
J. Antonopoulos

PACON 88 REPORT

The third Pacific Congress on Marine Science and Technology (PACON 88), held at the Pacific Beach Hotel, Honolulu, May 16-20, 1988 was attended by 221 participants from 17

countries including representatives from Australia, China, Japan, Korea, Taiwan, Thailand, and the U.S.S.R. The single largest delegation of 52 came from Japan. For the first time, representatives from the Federal Republic of Germany, Italy, the United Kingdom, and Finland participated. One hundred fifty seven papers were presented in twenty four technical sessions and four workshops. Each day started with a one-hour general lecture, which set the stage for the sessions of that day and brought the participants together. On the last day, four four-hour workshops were specialty mini-conferences where the first two hours of formal presentations were followed by two hours of discussion. Thirteen exhibitors displayed their products, programs, and services. As customary at PACONs, Proceedings of PACON 88 (more than 700 pages) were given to the registrants.

GEOPHYSICAL INFORMATICS, MOSCOW, USSR, 14-18 AUGUST 1988

A workshop of Geophysical Informatics was held in Moscow, 14-18 August 1988, covering topics on computer and other types of data handling which were of interest to World Data Centers and other Data Centers in geosciences. For more information about the workshop please write to: J. H. Allen, Co-chairman Organizing Committee, Panel on World Data Centers, NGDC, 325 Broadway, Boulder, Colorado 80303, USA.

JOA MEXICO 23-31 AUGUST 1988

The Joint Oceanographic Assembly (JOA) held its meeting on 23-31 August 1988 at the Acapulco Convention Center in Acapulco, Mexico. The JOA was organized by the Scientific Committee on Oceanic Research (SCOR), and a Mexican Organizing Committee repre-

senting several governmental and private organizations in Mexico. The meeting had co-sponsorship of several international organizations and had received support from the Intergovernmental Oceanographic Commission (IOC) and UNESCO. The scientific program consisted of general symposia on invited papers on selected topics of broad interdisciplinary interest; special symposia on designated interdisciplinary subjects; an association session of contributed papers and posters. For additional information in Mexico, contact: Roberto Gutierrez-Galera, Secretario Ejecutivo, JOA Mexico, 1988, c/o CONACYT, Apartado Postal 20033, 04510, Mexico, D.F.

ITSU AND ITIC PARTICIPATION IN UNESCO NATURAL HAZARDS MEETING

On March 14-18, 1988, an Advisory Experts Meeting was held at UNESCO Headquarters in Paris on UNESCO's Natural Hazards Program in preparation for the International Decade of Natural Disaster Reduction (IDNDR). Mr. Richard Hagemeyer, ITSU Chairman, and Dr. George Pararas-Carayannis, Director, ITIC, were among the international experts invited to participate and contribute. The meeting included, among others, the heads of several international scientific organizations, including IASPEI, IUGG, and IAVCEI. The purpose of the meeting was to recommend realistic and achievable actions that UNESCO can consider in its Medium-Term Plan in seeking to align with the IDNDR, and to assist UNESCO in preparing a document to be proposed to the Secretary-General of the United Nations to use in his report at the 43rd Session.

2ND INTERNATIONAL TSUNAMI WORKSHOP

The 2nd International Workshop on the Technical Aspects of the Tsunami Warning Sys-

tem, Tsunami Analysis Preparedness Communication and Instrumentation is scheduled for August 4-5, 1989 in Novosibirsk, USSR, following the IUGG Tsunami Symposium and proceedings the XII Session of the International Coordination Group on the Tsunami Warning System in the Pacific. (ITSU-XII)

The IUGG Tsunami Symposium is scheduled for July 31-August 3 and the ITSU-XII is scheduled for August 7-10, 1989.

For registration and information write to:

Dr. Viatcheslav K. Eusiakov,
Secretary
Tsunami 89 Organizing Committee Computing Center
Novosibirsk, 630090 USSR
Or phone (3832)352-756

INTERNATIONAL TSUNAMI INFORMATION CENTER

DIRECTOR, ITIC PARTICIPATES AT XIII EUROPEAN GEOPHYSICAL SOCIETY MEETING

Dr. George Pararas-Carayannis, Director ITIC, participated at the XIII General Assembly of the European Geophysical Society at the University of Bologna, Italy, on March 21-25, 1988. In addition to chairing a tsunami session, Dr. George Pararas-Carayannis presented a paper entitled "The Tsunami Generated from the Eruption of the Volcano of Santorin in the Bronze Age."

DIRECTOR ITIC ATTENDS UNDRO SPONSORED TSUNAMI MEETING, GUAYAQUIL, ECUADOR, 6-9 JUNE 1988

Dr. George Pararas-Carayannis, Director of ITIC attended a special Regional Tsunami Meeting sponsored by the United Nations Dis-

aster Relief Organization (UNDRO) at the Oceanographic Institute of the Ecuadorian Navy, in Guayaquil, Ecuador, on 6-9 June 1988. The regional meeting was attended by representatives from Chile, Colombia, Ecuador, Guatemala, Honduras, and Peru. Dr. Pararas-Carayannis made a presentation on tsunamis of the 20th Century and on future tsunami risk.

TALK RADIO HAWAII K108 AND NEW ZEALAND NATIONAL RADIO INTERVIEWS

Dr. George Pararas-Carayannis of ITIC, was guest of the morning one-hour talk radio program on May 13, 1988 in Honolulu. The Director of ITIC was interviewed on a number of tsunami-related items and responded to questions phoned in by the public. The interest in the program was so great that he was interviewed for a second time on May 18.

During a short trip to New Zealand the week of May 20-24, Dr. Pararas-Carayannis was interviewed by the New Zealand National Radio, and the New Zealand Herald on the potential tsunami risk of New Zealand.

SOVIET AND JAPANESE SCIENTISTS VISIT ITIC

A number of Soviet and Japanese scientists participated at the PACON'88 and the Seismological Society of America Conferences in Honolulu, in May. The scientists visited the Pacific Tsunami Warning Center (PTWC) and the International Tsunami Information Center (ITIC).

Dr. Masami Okada of the Japanese Meteorological Agency (JMA) was one of the ITIC visitors and discussed his work on tsunami travel time charts. Visitors from USSR included Professor A.S. Alekseev, Director, Novosibirsk Computing Center, and his lovely wife, who is



(left) Participants to the Tsunami Session of the XII Assembly of the European Geophysical Society in Bologna, Italy. (l. to r.) Prof S. Soloviev, Prof. K. Iida, Dr. G. Pararas-Carayannis and Prof. W. Adams.

Recent ITIC visitors – Dr. V. Gusiakov (bottom left) and Dr. Masami Okada of JMA (bottom right) with Dr. G. Pararas-Carayannis of ITIC.



a Geophysicist; Dr. A. V. Nikolaev, Head of the Exploration Geophysics Department of the Institute of Earth Physics; and Dr. Viacheslav Gusiakov, Senior Researcher, Computing Center, Siberian Branch of the USSR Academy of Sciences. The Soviet visitors had talks also with Mr. Richard Hagemeyer, Chairman of ITSU, and visited the Pacific Tsunami Warning Center.

IOC/ITSU

RICHARD H. HAGEMEYER ELECTED CHAIRMAN OF ITSU

At the XI Session of ICG/ITSU in Beijing, China, Mr. Richard H. Hagemeyer, Director of the U.S. National Weather Service - Pacific Region, Program Manager of the U.S. Tsunami Warning Program,



and Chairman of the U.S. Delegation, was elected as Chairman of the Group.

Mr. Hagemeyer has extensive background and experience, and has held numerous high administrative positions within the U.S. National Oceanic and Atmospheric Administration (NOAA), including the position of Executive Director of the U.S. National Weather Service. Mr. Hagemeyer has been Program Manager of the Tsunami Program since April 1982, when he assumed also the position of Director, Pacific Region. In this role, Mr. Hagemeyer has full responsibility for all of the U.S. National Weather Service activities in the Pacific area.

TWENTY-FIRST SESSION OF THE EXECUTIVE COUNCIL OF THE INTERGOVERNMENTAL OCEANO- GRAPHIC COMMISSION, PARIS, 7-15 MARCH 1988

The Intergovernmental Oceanographic Commission held the Twenty-first Session of its Executive Council in Paris, on 7-15 March 1988. Included in the program was a report by the Chairman of ICG/ITSU, Mr. Richard Hagemeyer, on the progress made by the Group as reported at the 11th Session of ICG/ITSU conference in Beijing, on 8-12 September 1987.

During the session and in anticipation of Dr. Iouri Oliounine's departure for USSR, Dr. G. Pararas-Carayannis, Director ITIC addressed the Group on the accomplishments of the International Warning System, and presented the Sr. Assistant Secretary of IOC, Dr. Oliounine, with a plaque commemorating the latter's outstanding leadership of the Program from 1981-1988.

LIST OF NATIONAL CONTACTS OF ICG/ITSU

The following is a list of National Contacts of ITSU members on file at the ITIC office. Please inform ITIC if there are any changes.

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IOC - ITSU

DR. IOURI OLIOUNINE

Dr. Iouri Oliounine, Senior Assistant Secretary of the Intergovernmental Oceanographic Commission (IOC), who has been responsible for the administration of the ITSU program, returned home to USSR this summer to assume new responsibilities. During his long tenure at the IOC Headquarters, in addition to his many responsibilities, Dr. Oliounine gave a great deal of attention and support to the Tsunami program and was an inspiration to everyone that worked with him.

SUMMARY REPORT OF THE ELEVENTH SESSION OF ICG/ITSU

The Intergovernmental Oceanographic Commission (IOC) published a summary report of the Eleventh Session of the International Coordination Group for the Tsunami Warning System in the Pacific. The Eleventh Session took place in Beijing, People's Republic of China, 8-12 September 1987. Copies of this report can be obtained by writing to the IOC Secretariat.

MASTER PLAN FOR THE TSUNAMI WARNING SYSTEM IN THE PACIFIC

Earlier this year, the Intergovernmental Oceanographic Commission circulated the Master Plan for the Tsunami Warning System in the Pacific. The Master Plan was prepared by Mr. Gerry Dohler, former Chairman of ITSU, in cooperation with the IOC Secretariat, the Director of ITIC, the Chairman of ITSU, and from comments made by the National Contacts of Member States of ITSU. Mr. Dohler presented also this Master Plan at the Tsunami Session of the Third International Conference on Natural and Man-Made Hazards in the Coastal Zones, in Ensenada, Mexico, in August 18, 1988. The Plan represents a great deal of effort by Mr. Dohler who devoted to the task much time and energy. Mr. W.J. Rapatz, ITSU

National Contact of Canada, and the Patricia Bay Institute of the Canadian Government were responsible for the professional publication of the Tsunami Master Plan.

A limited number of copies of this Plan are available through the IOC Secretariat or ITIC.

IOC TSUNAMI WORKSHOP REPORTS

Earlier this year IOC published and distributed Workshop Report #40 and its Supplement on the Technical Aspects of Tsunami Analyses, Prediction and Communications. This Workshop was held at Sidney, B.C. Canada, on 29-31 July 1985. For copies of these reports write to the IOC Secretariat.

IOC PUBLISHES WAVE REPORTING MANUAL

Earlier this year, the Intergovernmental Oceanographic Commission published a manual on Wave Reporting Procedures for Tide Observers in the Tsunami Warning System. This is a 1988 revised edition of the manual, which includes updated information on reporting stations in the Tsunami Warning System. The report outlines duties of tide observers, message formats, communication testing, and other important information.

UNESCO'S NATURAL HAZARDS PROGRAM MEETING, 14-18 MARCH 1988

UNESCO held an Advisory Expert Meeting on its Natural Hazards Program, on 14-18 March 1988. The objective of this meeting was to recommend:

1. A realistic and achievable plan of actions that UNESCO can consider in its Medium-Term Plan (1990-1995) in seeking to align with the International Decade

for Natural Disaster Reduction (IDNDR) (1990-2000).

2. To identify the most realistic, strongest, and efficient mechanism within UNESCO to implement its Medium-Term Plan and to carry out coordinated activities of IDNDR.
3. To assist UNESCO in preparing a document that can be proposed to the Secretary-General of the United Nations to use in his report at the forty-third session on the IDNDR.

The experts invited to participate at this meeting included:

W. Hays, US Geological Survey

R.D. Adams, Secretary-General, IASPEI

Fournier d'Albe, Ex-UNESCO Officer

R.H. Hagemeyer, National Oceanic Atmospheric Administration

V. Karnik, Ex-UNDRO Officer

V.I. Keilis-Borok, President IUGG

G. Pararas-Carayannis, Director, International Tsunami Information Center

H.U. Schmincke, General Secretary, IAVCEI

K. Toki, Disaster Research Institute, Kyoto University

A. Villeveille, Ex-Director, Delegation Aux Risques Majeurs

A. Volker, Chairman, Netherlands National Committee for the IHP

The UNESCO Secretariat Science Sector was represented by:

ADG/SC A.R. Kaddoura

SC/GEO V. Sibrava, Director

M. Hashizume

B. Rouhban

SC/HYD J. Gladwell

F. Verhoog

SC/IOC I. Oliounine and/A. Tolkachev

SC/TER A. Koridze

Other sectors of UNESCO were also represented at this meeting.

NEW IOC TSUNAMI COORDINATOR

Since July of this year, Dr. Al Tolkachev, Senior Technical Assistant Secretary of the Intergovernmental Oceanographic Commission assumed responsibility for the coordination of the Tsunami Program. Dr. Tolkachev has been with IOC for several years and is thoroughly familiar with the Tsunami Program. He is succeeding Dr. I. Oliounine to this post.

NATIONAL & AREA REPORTS

COLOMBIAN COMMISSION ON OCEANOGRAPHY

Since December 1987, Capitan de Fragata Ricardo Alvarado Reyes, Secretary General of the Colombian Oceanographic Commission was assigned new duties. The new Secretary General of the Colombian Oceanographic Commission is Capitan de Fragata, Rafael Steer Ruiz.

THAILAND DESIGNATES NEW TSUNAMI NATIONAL CONTACT

Dr. Choompol Swasdiyakorn, Secretary-General and Chairman, Thailand National Marine Science Committee, informed IOC that Lt. Sukit Yensung, Meteorology Department, Ministry of Communication will be Thailand's new National Contact for the Tsunami Warning System in the Pacific.

NATIONAL COMMITTEE ON THE TSUNAMI WARNING SYSTEM, COLOMBIA

The National Oceanographic Commission of Colombia has established procedures for a National Tsunami Warning System in Colombia. A plan prepared by the National Committee makes a number of recommendations for establishing tide and seismographic stations, and communications. The plan recommends that a proposal be prepared to be submitted by IOC to UNDP to establish an automated Tsunami Warning System in Colombia and asks IOC, ICG/ITSU, and ITIC, to assist with the development of the proposal to UNDP.

JAPAN HOSTS TSUNAMI SEMINAR

The Japan Meteorological Agency (JMA) hosted an International Tsunami Seminar in the Western Pacific Region (ITSWPR), in early March of this year. Representatives were invited from Indonesia, Hong Kong, Philippines, China, Korea, and the USA. The Geophysicists-in-Charge of the Pacific Tsunami Warning Center (G. Burton), and of the Alaskan Tsunami Warning Center (T. Sokolowski) attended. The Seminar was supported by the Japan Foundation for Shipbuilding Advancement. The participants provided summaries of the historical and potential tsunami threat to their countries, their seismic and sea level data acquisition capabilities, and the operation of their tsunami warning services.

An extensive tour was provided of JMA, with emphasis on the operations of their tsunami warning system and their earthquake prediction system. The heart of these systems is the Earthquake Phenomena Observation System (EPOS), a comprehensive computer hardware/software capability using real-time data transmission of seismic and sea level data from throughout Japan. EPOS was designed by Mitsubishi Corporation, and is leased to JMA for \$100,000 per month. EPOS was developed

as a dual result of the need for improved tsunami warning services following the 1983 Sea of Japan tsunami, and for the prediction of a forthcoming great earthquake and tsunami in the Tokai District of Shizuoka Prefecture.

Following the Tokyo Seminar, participants were taken on a two-day field trip to Shizuoka Prefecture to view the various tsunami mitigation measures being used in anticipation of the Tokai earthquake. These varied from simple signs to aid evacuation of threatened areas, to deployment of a network of ocean bottom seismometers, and to construction of a lengthy 90 km wall with automatic gates closing off harbors and river channels. Japan has invested enormous resources in all aspects of tsunami mitigation. It was obvious to all ITSWPR participants that Japan has invested for the future, and invested well.

US - USSR COOPERATION ON TSUNAMI WARNING SERVICES

During the end of May Mr. Richard Hagemeyer, ITSU Chairman and U.S. Tsunami National Contact and the Pacific Tsunami Warning Center hosted a delegation of scientists from the USSR. The delegation was headed by Academician Anatoly S. Alekseev, Director of the Novosibirsk Computer Center in Central Siberia, and included Dr. Viacheslav Gusiakov, Chief of the Tsunami Laboratory at Novosibirsk. In addition to visiting PTWC, the Soviet scientists were in Honolulu to attend the Joint Conference of the Seismological Society of America and the Seismological Society of Japan.

The Soviet scientists were interested in increased interaction with the U.S. Tsunami Warning Service, and hope to send an additional delegation to visit Hawaii in the near future. This would be followed, sometime next year, by an exchange of scientists from PTWC going to Novosibirsk.

MEXICO PREPARES TSUNAMI BROCHURE

Dr. Salvador Farreras of the Centro de Investigacion Cientifica y de Educacion Superior de Ensenada (CICESE), B.C. in Mexico, forwarded to ITIC a new tsunami brochure prepared by the Center, entitled, "Que hacer en caso de Maremoto." This publication, prepared jointly by the Secretary of the Navy and CICESE and the Civil Protection Agency of Baja California, outlines the measures to be taken by the public in case of tsunami warning and provides useful information and public education. Copies of the brochure can be obtained by writing to Dr. Salvador Farreras, Centro de Investigacion Cientifica y de Educacion Superior de Ensenada, B.C., P.O. Box 4844, San Ysidro, CA 92073.

PACON '88

The Pacific Congress on Marine Science & Technology (PACON 88) was held in Honolulu, Hawaii, 16-20 May 1988. The Congress was well attended and the papers and discussions that were presented were of multi-disciplinary nature. Sessions were held on several categories pertaining to marine sciences including a session on tsunamis and several workshops. The tsunami session included a total of 13 papers.

The following is a listing of the tsunami papers presented at PACON '88:

Large Tsunamis and their Sources in the Pacific - K. Iida, Aichi Institute of Technology, Toyota, Japan

Preliminary Assessment of the Local Tsunami Threat to the Pacific Northwest Coast of North America - G. Hebenstreit, Science Applications International Corporation, McLean, Virginia; T.S. Murty, Institute of Ocean Sciences, Sidney, British Columbia, Canada

Tide Gauge Response: Measurements and its Effects on Tsunami Waveforms - K. Satake, Department of Applied Physics, Tokyo Institute of Technology, Meguro-ku, Tokyo, Japan; M. Okada, Meteorological Research Institute, Tsukuba, Ibaraki, Japan; K. Abe, General Education Department, Nippon Dental University, Niigata, Japan

Small Scale Edge Wave Observed Along the Japan Sea Coast in the Submarine Earthquake (M=5.9) of March 24, 1987 - K. Abe, General Education Department, Nippon Dental University, Niigata, Japan

Tsunami Propagation in Rivers as an Undular Bore - Y. Tsuji, Earthquake Research Institute; T. Yanuma, C. Fujiwara, I. Murata, Y. Nagata, Geophysical Institute, Faculty of Science, University of Tokyo, Tokyo, Japan

The Application of Satellite Technology at the Pacific Tsunami Warning Center - G.D. Burton, Pacific Tsunami Warning Center, Ewa Beach, Hawaii

Tsunami Modeling Using Personal Computers - C. Mader, G. Mitchum, Joint Institute for Marine and Atmospheric Research and Toga Sea Level Center, University of Hawaii, Honolulu, Hawaii

A Computer Program for Producing Tsunami Travel Time Chart in Japan - M. Okada, Meteorological Research Institute, Tsukuba, Ibaraki, Japan

Nonlinear Shallow-Water Waves: The Green-Naghdi Equations R.C. Ertekin, Department of Ocean Engineering, University of Hawaii, Honolulu, Hawaii

A Conception for Tsunami Zoning in the Inner Seas - B. Rangelov, E. Spassov, Geophysical Institute, Sofia, Bulgaria

The Numerical Simulation of the Sudden

Developing of the Cyclone to Move into the Sea Region from East China - Z. Yu, J. Du, Center of Marine Sciences, Nanjing University, Nanjing, China

Impact on Hawaii of the Recent Performance of Some Tsunami Warning Systems - W.M. Adams, Department of Geology and Geophysics, University of Hawaii, Honolulu, Hawaii

Correlation Between Seismic Moments, Mantle Magnitudes, and Amplitudes of Tsunamis in Polynesia - J. Talandier, Laboratoire de Geophysique, Commissariat a l'Energie Atomique, and Centre Polynésien de Prevention des Tsunamis, Papeete, Tahiti, French Polynesia; E. Okal, Department of Geological Sciences, Northwestern University, Evanston, Illinois

ANNOUNCEMENTS

SECOND INTERNATIONAL COURSE ON DISASTER MEDICINE, 17 OCTOBER - 5 NOVEMBER 1988, REPUBLIC OF SAN MARINO

The European Center for Disaster Medicine held its Second International Course on Disaster Medicine at the Republic of San Marino on 17 October - 5 November 1988. For further information regarding this meeting, write to: Dr. Giancarlo Ghironzi, Secrétaire General CEMEC, Ospedale di Stato Repubblica di San Marino. Telephone: 39 (O) 541 994535 - 903706, Telex: 0505 - 893 - PROT. CIV. SO. The meeting was held under the auspices of the Council of Europe.

IOC-SCOR-WMO-ICSU INTERNATIONAL WOCE SCIENTIFIC CONFERENCE

The Joint IOC-SCOR-WMO-ICSU International WOCE Scientific Conference will be hosted by the Intergovernmental Oceanographic Commission (IOC) and will be held at UNESCO Headquarters in Paris, on 28 November - 2 December 1988. The conference will be dealing with the World Ocean Circulation Experiment (WOCE) and, in general, with the World Climate Research Program (WCRP). In addition to IOC, the conference is sponsored by the World Meteorological Organization (WMO), the International Council of Scientific Unions (ICSU) and the Scientific Committee on Ocean Research (SCOR). The conference will be dealing both with the scientific aspects of WOCE and the possible national commitments of participation in the experiment. It is expected to be attended by government experts and scientists in their own capacity.

PTC'S 11TH ANNUAL CONFERENCE, 15-18 JANUARY 1989, HONOLULU, HAWAII

The 11th Annual Conference on the Pacific Telecommunications Council (PTC) will be held at the Sheraton Waikiki Hotel in Honolulu on 15-18 January 1989. PTC'89 will address the rapidly developing arena of networks, information and entertainment services, work stations, and the management of these endeavors from the perspective of the user and the provider. Topics will include the evolving technology, standards and connectivity, as well as the development of Pacific hemisphere telecommunications facilities. For more information, write to: PTC'89, 1110 University Avenue, Suite 308, Honolulu, Hawaii 96826, USA.

**INTERNATIONAL SYMPOSIUM ON
INTERMONTANE BASINS,
CHIANG MAI, THAILAND,
30 JANUARY - 2 FEBRUARY 1989**

An International Symposium on Intermontane Basins will be held on 30 January - 2 February 1989 in Chiang Mai, Thailand. The main objective of this symposium is to set up a state of the art of research of intermontane basins in Eastern Asia, and to make comparisons with modern and ancient analogues in other part of the world.

For more information, write to: The Conference Secretary, Department of Geological Sciences, Faculty of Science, Chiang Mai University, Chiang Mai 50002, Thailand. The symposium is organized by the Association of Geoscientists for International Development (AGID), the Petroleum Institute of Thailand Foundation (PTIT), the Geological Society of Thailand (GST), and Chiang Mai University (CMU), with support from the Canadian International Development Agency (CIDA).

**INTERNATIONAL SYMPOSIUM ON
NATURAL CATASTROPHES
AND THEIR IMPACT
27-30 MARCH 1989, ANKARA,
TURKEY**

An international symposium on Natural catastrophes and their impact will be held in Ankara, Turkey, as part of the 25th Anniversary of the Association of Geomorphologists of Turkey. The symposium intends to provide a forum for seismologists, oceanographers, geomorphologists, engineers, administrators, civil defense and emergency-response officials to discuss all aspects of natural catastrophes: monitoring, forecast, assessment, prevention and mitigation. Special emphasis will be given to the impact of severe weather, tsunamis, storm surges, floods, avalanches, landslides, erosion, earthquakes, volcanoes and risk assessment. Plans and programs in support of

the International Decade of Natural Disasters Reduction (IDNDR) are also welcomed.

Original abstracts, not to exceed two pages, should be sent before December 1, 1988 to Mr. Tevfik ERKAL, Türkiye Jeomorfologlar Dernegi, P.K. 652 Kizilay, 06425, Ankara, Turkey. For further details and information, please contact the same address.

In addition, a copy of the abstract should be sent to the Convenor Professor M.I. El-Sabh. Good quality, high standard papers, undergoing full and careful editorial review and refereeing will be published in a special issue of Natural Hazards. Authors are encouraged to submit their full-length manuscript (in triplicate) for consideration to:

Professor M.I. El-Sabh, Editor
Natural Hazards
c/o Departement d'oceanographie
Universite du Quebec a Rimouski
300, Allee des Ursulines
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**SIXTH SYMPOSIUM ON COASTAL
AND OCEAN MANAGEMENT
JULY 11-14, 1989
CHARLESTON, SOUTH CAROLINA,
U.S.A.**

The sixth multidisciplinary conference on comprehensive coastal and ocean planning and management (COASTAL ZONE 89) will be held on July 11-14, 1989 in Charleston, South Carolina, USA. Professionals, decision-makers, and all interested persons are encouraged to participate in this international exchange of information and views geared to promote improved use, development, protection, and understanding of coastal, ocean, and marine resources.

For more information and submission of abstracts write to:

Orville Magoon
Coastal Zone 89
P.O. Box 279
Middletown, CA 95461

**SYMPOSIUM ON PREPAREDNESS,
MITIGATION AND MANAGEMENT
OF NATURAL DISASTERS -
AUGUST 2-4, 1989,
NEW DELHI, INDIA**

The Indian Society of Earthquake Technology and the Indian Society of Engineering Geology are sponsoring a Symposium on Preparedness, Mitigation and Management of Natural Disasters, on August 2-4, 1989, in New Delhi, India.

The objectives of the Symposium are to bring together researchers, planners, scientists, engineers and sociologists for exchanging information and holding intensive discussions and to arrive at concrete recommendations for mitigating damages caused by natural hazards.

For more information on the Symposium, write to:

Dr. R.C. Agrawal
Secretary General, Symposium PMMND
Dept. of Earthquake Engineering
University of Roorkee
Roorkee 247667, India

**IOC PREPARES UPDATED
TSUNAMI BROCHURE**

The International Tsunami Information Center was funded by the Intergovernmental Oceanographic Commission (IOC) to prepare an updated tsunami brochure. This brochure has been completed and 200 copies of the brochure were forwarded to each National Contact of ICG/ITSU for distribution. The new brochure outlines all the latest information on tsunami warning procedures and gives a listing of all the new reporting stations in the Tsunami Warning System. For more information or

copies, write to the Director of ITIC, Box 50027, Honolulu, HI 96850-4993

**PACIFIC TSUNAMI
WARNING CENTER**

**WEDDING BELLS RING OUT
FOR PTWC GEOPHYSICIST**

Mr. Richard Sillcox, Geophysicist at the Pacific Tsunami Warning Center in Honolulu, Hawaii married Nancy Chiu on 23 January 1988. Nancy served as ITIC librarian for one year. The ITIC staff wishes this charming couple congratulations and much happiness.

**MR. GORDON BURTON VISITS
NEW ZEALAND CIVIL DEFENSE**

At the invitation of the Ministry of Civil Defense Mr. Gordon Burton, Geophysicist-in-Charge of the Pacific Tsunami Warning Center (PTWC) visited New Zealand during the period June 26 to July 4, 1988. The visit was coordinated by Mr. Grant Elder, Civil Defense Commissioner, who accompanied Mr. Burton and arranged for an extensive itinerary, which included visits with the Northern Zone Headquarters in Auckland, with the Central Zone Headquarters, Palmerston North, with the Southern Zone Headquarters and the Ministry of Civil Defense in Wellington. Mr. Burton also visited seismic and tide stations at Marsden Point, Wellington, Port Lyttleton, and also visited the DSIR Oceanographic Institute, where he met with Dr. Ron Heath, Director, and with Dr. Alex Gilmour, ICG/ITSU National Contact. Mr Burton participated in a national tsunami exercise. The visit was very fruitful and resulted in many improvements related to tsunami preparedness in New Zealand and to the Pacific Tsunami's Warning System.

IRIS/GEOSCOPE PROJECTS

In the world of earthquake seismology, new instrumentation is being used to more accurately measure the propagation of seismic waves through the earth. Where previously seismometers were classified as either Short-Period (1 second) or Long-Period (20 seconds), based on their respective responses, the new Broad-Band seismometers can measure seismic waves with frequencies of a fraction of a Hertz to 300. This provides a much greater understanding not only of the size of earthquakes, but of the structure of the earth's crust and interior. The impact of the world seismological community has been unparalleled since the early 1960's, when the World Wide Standard Seismograph Network (WWSSN) was developed.

The French government is sponsoring Project GEOSCOPE, a worldwide network of Broad-Band seismometers with one station at the Pacific Tsunami Warning Center's cave at Kipapa Gulch. The equivalent effort by the

United States is Project IRIS (Incorporated Research Institutions for Seismology). Kipapa has been selected as the only station worldwide where IRIS and GEOSCOPE instrumentation will be collocated. During the end of May, both IRIS and GEOSCOPE teams were at Kipapa, installing their respective equipment and upgrading the station. In addition, the French installed a terminal at PTWC for remote access to the GEOSCOPE data on a daily basis and for monitoring the performance of the equipment. With the installation of a telephone circuit by IRIS, PTWC will also have access to their data. This opens up the potential for PTWC to compute seismic moments for major earthquakes based on Very Long Period (VLP) waves with periods of 200 to 300 seconds. As such, a more accurate determination can be made of the size of the earthquake and of the probability of a tsunami having been generated. Through coordination with both IRIS and GEOSCOPE, PTWC is able to join the revolution.

SEISMIC SUMMARY

(1 JANUARY 1988 TO PRESS TIME)

EVENT NO.	EVENT	LOCATION	ACTION TAKEN
1988-1	Jan 19 0730Z 6.5	Antofagasta, Chile 24.6S 070.0W	Tsunami information message issued
1988-2	Jan 22 1205Z 6.6	Tennant Creek, Australia 19.0S 134.0E	No tsunami information message issued
1988-3	Feb 05 1401Z 6.6	Antofagasta, Chile 23.8S 070.6W	Tsunami information message issued
1988-4	Feb 05 1849Z 6.6	Antofagasta, Chile 25.3S 069.6W	No tsunami information message issued
1988-5	Feb 24 0359Z 6.7	300 miles Southeast of Manila, Philippines 13.6N 124.4E	Tsunami information message issued
1988-6	Feb 26 0618Z 6.9	South of Madagascar 37.8S 048.1E	No tsunami information message issued
1988-7	Feb 29 0532Z 6.6	Kommandorski Islands, USSR 54.8N 168.0E	Tsunami information message issued
1988-8	Mar 06 2236Z 7.3	210 miles south of Cape Yakataga, Alaska 57.4N 142.7W	Tsunami watch issued bulletin 001,
1988-9	Apr 12 2320Z 6.8	Southern Peru, near Africa, Chile 17.5S 071.9W	No tsunami information message issued
1988-10	May 09 2321Z 6.6	113 miles ESE of Lima, Peru 12.7S 075.5W	No tsunami information bulletin issued
1988-11	Jun 03 2328Z 6.6	West coast of South Is., New Zealand 45.2S 167.6E	No tsunami information bulletin issued

Tsunami Newsletter

EVENT NO.	EVENT -	LOCATION	ACTION TAKEN
1988-12	Jun 18 2250Z 6.9	Gulf of California 90 miles S of Guaymas, Mexico 26.8N 110.9W	Tsunami information bulletin issued
1988-13	July 05 2032Z 6.7	SW New Britain, Western Solomon Sea 06.1S 148.7E	Tsunami information bulletin issued
1988-14	July 23 1517Z 6.6	Solomon Sea 06.0S 153.0E	No tsunami information bulletin issued
1988-15	July 25 0646Z 6.9	Eastern Banda Sea 04.9S 133.7E	Tsunami information bulletin issued
1988-16	Aug 06 0036Z 6.8	Burma 25.1N 094.9E	No tsunami information bulletin issued
1988-17	Aug 10 0439Z 7.5	Guadalcanal 10.1S 160.9E	Tsunami information bulletin issued
1988-18	Aug 14 1753Z 6.5	Chile 27.5S 070.3W	Tsunami information bulletin issued
1988-19	Aug 20 6.5	Nepal 27.3N 087.1E	No tsunami information bulletin issued